CLAIMS

1. A hydrogenation catalyst for hydrocarbon oil, which is produced by impregnating a refractory inorganic oxide carrier with a solution containing a water-soluble metal compound of Group 4 of the Periodic Table so that it carries the metal compound, then further impregnating with an aqueous solution containing at least one metal compound of Group 6 and at least one metal compound of Groups 8 to 10 of the Periodic Table so that it carries the metal compounds, and thereafter heating it at a temperature not higher than 300°C.

2. The hydrogenation catalyst for hydrocarbon oil as claimed in claim 1, wherein the metal compound of Group 4 of the Periodic Table is a titanium compound.

3. The hydrogenation catalyst for hydrocarbon oil as claimed in claim 2, wherein the titanium compound is a salt of a titanium-peroxohydroxycarboxylic acid.

4. A hydrogenation catalyst for hydrocarbon oil, which is produced by impregnating a refractory inorganic oxide carrier with an aqueous solution containing a salt of a titanium-peroxohydroxycarboxylic acid so that it carries the titanium compound, then further impregnating with an aqueous solution containing at least one metal compound of Group 6 and at least one metal compound of Groups 8 to 10 of the Periodic Table so that it carries the metal compounds.

5. The hydrogenation catalyst for hydrocarbon oil as

claimed in any of claims 1 to 4, wherein the refractory inorganic oxide is alumina.

6. The hydrogenation catalyst for hydrocarbon oil as claimed in any of claims 2 to 5, wherein the amount of titanium in terms of its oxide form falls between 1 and 15 % by weight of the refractory inorganic oxide carrier.

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7. The hydrogenation catalyst for hydrocarbon oil as claimed in any of claim 1 to 6, wherein the metal of Group 6 of the Periodic Table is molybdenum and the metal of Groups 8 to 10 of the Periodic Table is nickel.

8. The hydrogenation catalyst for hydrocarbon oil as claimed in any of claims 1 to 7, which carries a phosphorus compound along with the metal compound of Group 6 and the metal compound of Groups 8 to 10 of the Periodic Table.

9. A method of hydrogenation of hydrocarbon oil, in which is used the hydrogenation catalyst of any of claims 1 to 8.

10. A method for producing a hydrogenation catalyst, which comprises applying a water-soluble organic compound having a boiling point or a decomposition point of not lower than 150°C to a refractory inorganic oxide carrier, then applying thereto a metal compound of Group 4 of the Periodic Table, and thereafter further applying thereto at least one metal compound of Group 6 and at least one metal compound of Groups 8 to 10 of the Periodic Table.

11. The method for producing a hydrogenation catalyst

as claimed in claim 10, wherein the catalyst produced is for hydro-desulfurization.

12. A method for producing a hydrogenation catalyst, which comprises applying a metal compound of Group 4 of the Periodic Table to a refractory inorganic oxide carrier, along with a water-soluble organic compound having a boiling point or a decomposition point of not lower than 150°C thereto, and thereafter further applying thereto at least one metal compound of Group 6 and at least one metal compound of Groups 8 to 10 of the Periodic Table.

13. The method for producing a hydrogenation catalyst as claimed in claim 12, wherein the catalyst produced is for hydro-denitrogenation.

14. A method for producing a hydrogenation catalyst, which comprises applying at least one metal compound of Group 6 and at least one metal compound of Groups 8 to 10 of the Periodic Table to a refractory inorganic oxide carrier, along with a water-soluble organic compound having a boiling point or a decomposition point of not lower than 150°C thereto, and thereafter further applying thereto a metal compound of Group 4 of the Periodic Table.

15. The method for producing a hydrogenation catalyst as claimed in claim 14, wherein the catalyst produced is for hydro-dearomatization.

16. The method for producing a hydrogenation catalyst

as claimed in any of claims 10 to 15, wherein a phosphorus compound is loaded on the refractory inorganic oxide carrier, along with the metal compound of Group 6 and the metal compound of Groups 8 to 10 of the Periodic Table thereto.

17. The method for producing a hydrogenation catalyst as claimed in any of claims 10 to 16, wherein the metal of Group 4 of the Periodic Table is titanium or zirconium.

18. The method for producing a hydrogenation catalyst as claimed in any of claims 10 to 17, wherein the metal of Group 6 of the Periodic Table is molybdenum or tungsten, and the metal of Groups 8 to 10 of the Periodic Table is cobalt or nickel.

19. The method for producing a hydrogenation catalyst as claimed in any of claims 10 to 18, wherein the refractory inorganic oxide carrier is alumina.

20. The method for producing a hydrogenation catalyst as claimed in any of claims 10 to 19, wherein the water-soluble organic compound having a boiling point or a decomposition point of not lower than 150°C is at least one selected from diethylene glycol, triethylene glycol, polyethylene glycol and butanediol.

21. A hydrogenation catalyst produced in the method of any of claims 10 to 20.

22. A method of hydrogenation of hydrocarbon oil, in which is used the hydrogenation catalyst of claim 21.

23. A metal compound-loading refractory inorganic oxide

carrier produced by impregnating a refractory inorganic oxide carrier with a metal compound and carrying the metal, in which the metal exists uniformly everywhere inside it.

24. A metal compound-loading refractory inorganic oxide carrier produced by impregnating a refractory inorganic oxide carrier with a metal compound and carrying the metal, of which the ratio, $x = Fm/F$, is at least 0.5 in the graph indicating the data of linear analysis of the metal atom in one direction obtained through electron probe microanalysis (EPMA) of the cross section of the carrier, and showing the relationship between the length, t, of the cross section in the cross direction of the carrier (t indicates the distance from one surface of the carrier) and the X-ray intensity, I, in which F indicates the integral value of the X-ray intensity I(t) with t being the distance between one surface of the carrier and the other surface thereof, and Fm indicates the integral value of the X-ray intensity Im(t) on the line tangential to the X-ray intensity curve at the minimum and smallest point of the curve, with t being also the distance between one surface of the carrier and the other surface thereof.

25. The metal compound-loading refractory inorganic oxide carrier as claimed in claim 23 or 24, wherein the refractory inorganic oxide carrier is γ-alumina.

26. The metal compound-loading refractory inorganic oxide carrier as claimed in any of claims 23 to 25, wherein the

metal compound is a metal alkoxide.

27. The metal compound-loading refractory inorganic oxide carrier as claimed in any of 23 to 26, wherein the metal is of Group 4 of the Periodic Table.

28. The metal compound-loading refractory inorganic oxide carrier as claimed in claim 27, wherein the metal of Group 4 of the Periodic Table is titanium.

29. A method for producing the metal compound-loading refractory inorganic oxide carrier of any of claims 23 to 28, which comprises impregnating a refractory inorganic oxide carrier with an aqueous solution that contains a water-soluble organic compound having a boiling point or a decomposition point of not lower than 150°C, then drying it, and thereafter further impregnating with a solution of a metal compound.

30. A method for producing the metal compound-loading refractory inorganic oxide carrier of any of claims 26 to 28, which comprises impregnating a refractory inorganic oxide carrier with an aqueous solution that contains a water-soluble organic compound having a boiling point or a decomposition point of not lower than 150°C, then drying it, and thereafter further dipping it in an alcoholic solution of a metal compound, metal alkoxide.

31. A hydrogenation catalyst having at least one metal of Group 6 and at least one metal of Groups 8 to 10 of the Periodic Table supported on the metal compound-loading

refractory inorganic oxide carrier of any of claims 23 to 28.

32. A hydrogenation catalyst having at least one metal of Group 6 and at least one metal of Groups 8 to 10 of the Periodic Table supported on the metal compound-loading refractory inorganic oxide carrier of any of claims 23 to 28, which is heated at a temperature not higher than 300°C.

33. A method of hydro-desulfurization of hydrocarbon oil, in which is used the hydrogenation catalyst of claim 31 or 32.

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